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Lumpy Jaw, or Actinomycosis

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EXTENT OF LUMPY JAW

Lumpy jaw, also known as big jaw, is the common name for peculiar tumorlike formations that occur on various parts of the head of cattle and occasionally other animals. The jaw in the region of the throat is principally affected. The abnormalities, composed of more or less fibrous swellings, generally enclose points of pus formation. The swellings result from either of two diseases, technically known as actinomycosis and actinobacillosis, each caused by a distinct type of micro-organism, or germ.

Lumpy jaw affects principally cattle, but other animals, such as sheep, goats, swine, horses, dogs, and cats are also susceptible. Human beings may also become infected with either of the two forms of lumpy jaw. The disease in either form is usually chronic; that is, long continued. It seldom causes death, except through occasional serious involvement of a vital organ, but it impedes growth or production to some extent in every animal affected.

Although lumpy jaw is not generally considered to be of great economic importance, Federal meat inspection records show that the disease occurs in about 1 percent of all cattle slaughtered. Since both actinomycosis and actinobacillosis may affect man, carcasses affected with these diseases should be inspected. So far as is known,

man does not acquire either disease from contact with infected cattle or meat of such animals, but it is possible that he may become diseased through some unknown intermediate agency. Therefore, carcasses showing generalized actinomycosis or actinobacillosis are condemned under Federal inspection regulations. If the condition of the carcass indicates a good state of nutrition and the lesions are strictly localized and uncomplicated, only the affected and contiguous parts are condemned. In only about 0.5 percent of all cases must the entire carcass be condemned.

Lumpy jaw occurs chiefly in the West and Southwest, but may occur in any region. It is generally found in relatively young slaughter cattle, but is occasionally seen in older cattle in which the disease has been allowed to progress for months or even years. It is usually these cases that become so seriously affected as to require condemnation. In one instance every animal in a shipment of 27 steers from one farm was affected to some extent. In 15 of these cases the entire carcass was condemned and the other 12 passed inspection only after the diseased parts and surrounding tissues were destroyed. Of the 27 heads from these cattle, 21 were condemned entirely. The steers were conspicuous in the public stockyards because of varying enlargements in the region of the head, neck, and shoulders. In many of them the tumefactions approached the size of a child's head.

CAUSE OF DISEASE

As previously mentioned, lumpy jaw, or big jaw, is the manifestation of either of two diseases, actinomycosis and actinobacillosis. The former is caused by invasion of the tissues by *Actinomyces bovis*, commonly called the ray fungus; the other, actinobacillosis, is caused by *Actinobacillus lignieresii*. *Actinomyces bovis* belongs to the group of organisms known as Actinomycetales, or the moldlike bacteria. *Actinobacillus lignieresii* belongs to the Eubacteriales, or true bacteria. The two organisms, though distinctly different in themselves, produce very similar abnormalities in the animals affected. For this reason actinomycosis and actinobacillosis are frequently confused. Actinomycosis, however, usually affects the bone, especially of the jaw, as shown in figure 1; whereas actinobacillosis attacks the soft tissues, such as lymph nodes (fig. 2) and tongue. However, both diseases may involve other tissues, such as muscle, lung, liver, stomach, udder, or brain.

DESCRIPTION OF LESIONS

The so-called tumors and abscesses on or in the region of the jaw may be in the lymph nodes, the salivary glands, the bones (fig. 3), the mucous membranes, or other tissues. When these are cut into, a close scrutiny with the naked eye or a hand lens will usually reveal minute grains in the generally tenacious, gray to yellowish-green pus. These granules vary in color from pale yellow to sulfur yellow; they may be very abundant or so few as to be overlooked. When removed from the tissue, they appear as roundish masses about one-half millimeter (one-fiftieth of an inch) or less in diameter. If the fresh granules are examined under the microscope, they are found to consist

of roundish masses, having a rosettelike structure of club-shaped bodies (fig. 4). Under higher magnification minute mycelial threads are found within the rayed structure, in the case of infection with the ray fungus. In actinobacillus infections the rosettes are generally smaller and more numerous, and bacteria instead of mycelia can be seen within the radiating clubs. Thus the nature of the lesion sometimes may be determined microscopically. Cultures made from fresh



FIGURE 1.—Head of steer showing a bad case of actinomycosis. Note how infection has broken through the skin and caused an open sore at the base of the jaw bone.

material also aid in diagnosis. However, these are technical procedures which generally will not be necessary in practical considerations of lumpy jaw.

The consistence of the granuloma, commonly referred to as a tumor, though it is not of the nature of a true tumor, varies according to the quantity of fibrous or connective tissue present. If there is little connective tissue, the tumor is inclined to be soft. As the quantity increases, the tumor becomes firmer and in cross section may have a spongelike appearance. The colonies of the micro-organisms are lodged in the pus which fills the spaces formed by the meshwork of connective tissue. If the surface of such a tumor is cut and scraped, the cell masses enclosing the organisms come away in the form of small, pale-yellow or sulfur-yellow granules, as previously described.

Invasion of the jawbones by the ray fungus results in a serious form of lumpy jaw. By slow extension the infection gradually undermines

the entire thickness of the bone (fig. 3). The process may continue outward working its way through muscle and skin and finally appears externally in the form of a stinking, fungoid growth. Small, tubelike openings that discharge pus may appear in the skin. The growth may at the same time work its way inward, pushing into the mouth, the nasal chambers, or the sinuses of the head. The disease may or may not spread to other organs, such as the lungs.



FIGURE 2.—Head of cow with lymph nodes affected with actinobacillosis.

In one form of actinobacillosis, the tongue is involved especially. There is an increase in the quantity of fibrous tissue in the organ, which is usually accompanied by areas of pus formation varying in size from that of a pinhead to that of a pea or larger. The tongue becomes increasingly hard and immobile and may protrude from the mouth in a manner very descriptively indicated by the term "wooden tongue." Ulcers may appear on the tongue, lips, the inside of the cheeks, and even on the muzzle. Ulcers or tumorlike formations

may occur in the pharynx, the larynx, or the trachea. Neighboring lymph nodes and internal organs may be involved.

The symptoms, of course, vary with the extent of the lesions. When the tongue is enlarged and protruding from the mouth, dribbling of saliva occurs. The condition is also accompanied by an offensive odor and more or less difficulty in eating. In such a case the animal usually becomes increasingly thin and weak, and finally dies of exhaustion if not treated.

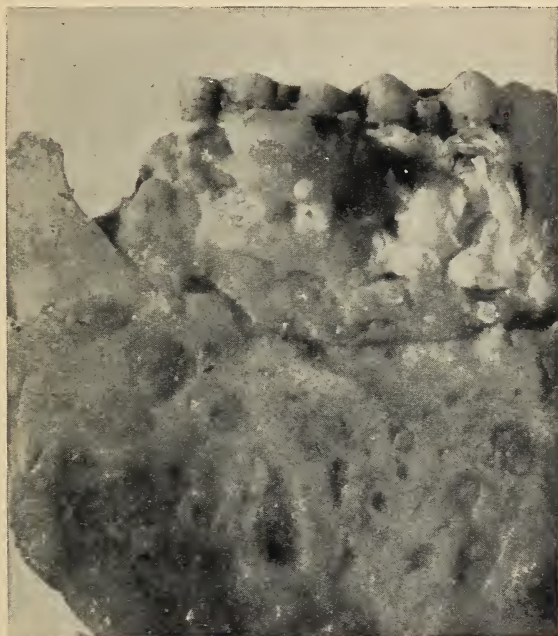


FIGURE 3.—Section of jawbone affected by actinomycosis. Development of granulation tissue is shown in the gums about the teeth in the upper part of the picture. In the bone (shown below) are cavities which contain the characteristic pus.

DEVELOPMENT OF THE DISEASE

So far as is known, both types of the infection gain entrance to the body tissues principally through abrasions or lacerations, usually in the mouth cavity. Particularly dry, harsh, rough feeds are known to damage the mucous membranes of the mouth; and the sharp, barbed awns of certain cereals and grasses, such as barley and foxtail, which are sometimes present in feeds, quite readily penetrate the membranes of the mouth and become buried in the deeper tissues. The infection may travel into the tissues with these feeds or, if present from other sources, find ready access to the body through the wounds they inflict. When cattle are teething, the gums are more or less tender and lacerated, thus affording another avenue for the ingress of the infection. The organisms causing actinomycosis and actinobacillosis may also invade other parts of the body through wounds. In human beings organisms like *Actinomyces bovis* have been found in

diseased tonsils and teeth, and the same condition probably occurs in the lower animals.

The course of actinomycosis and actinobacillosis is generally slow. Actinomycosis rarely attacks the body externally except about the head and upper part of the neck. Actinobacillosis, on the other hand, may involve any of the lymph nodes, externally as well as internally, causing swellings on any part of the body. The tumors in certain parts of the body, as they grow, may interfere with the natural functions of the body.

Actinomycosis of the jawbone leads to destruction of the bone with more or less displacement of the teeth and consequent interference

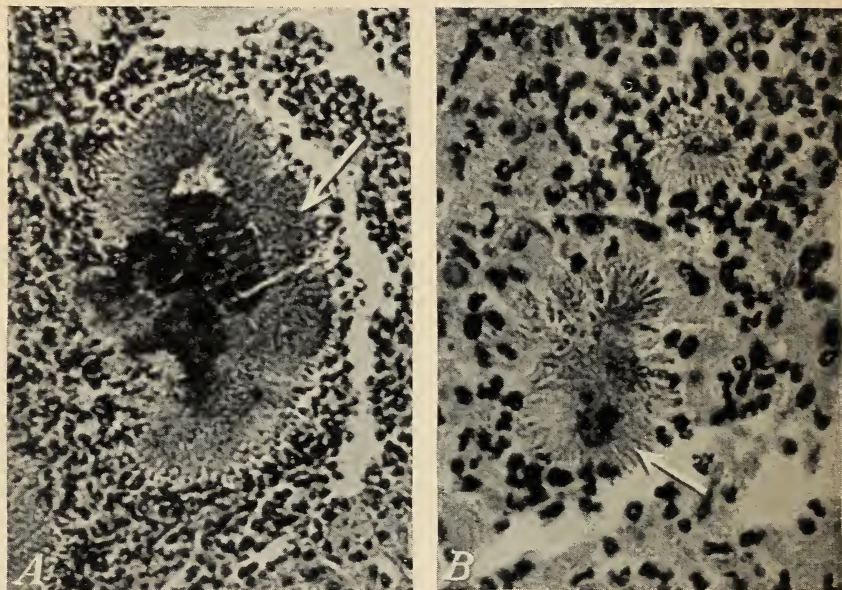


FIGURE 4.—Microscopic sections of lesions of lumpy jaw, showing rosettes or formation of rayed clubs, indicated by arrows: A, actinomycosis of the bone, magnified 250 times; B, actinobacillosis of a lymph node, magnified 450 times.

with proper chewing of the feed. When actinobacillosis attacks the soft parts of the head, obstructions may arise in the mouth as the result of intruding growths of the tumors. When the tumors exist in the pharynx, they may partially obstruct the movements necessary to swallowing. Growths in the larynx or trachea tend partially to close the air passages and cause difficulty in breathing. Actinobacillosis of the tongue interferes with the many and varied movements of this important organ. The localized disease affects the general health only indirectly unless the internal organs, such as the lungs, become seriously involved. The general tendency of either actinomycosis or actinobacillosis is to progress unless the disease process is stopped by treatment, but a very small proportion of the cases may recover spontaneously.

In sheep actinobacillosis usually occurs about the head, on the lips, under the jaws, or in the throat, but it may invade the lungs. The causative organism usually finds its way into the body through per-

forations of the skin by needlegrass awns, cactus spines, or other penetrating substances in the feed. Actinobacillosis is not common, and actinomycosis is rare in sheep.

Apparently actinomycosis is more common in swine than actinobacillosis, but neither disease occurs to any great extent in this species. The usual site of the disease in sows is the udder into which the organisms are probably introduced through teat wounds caused by the sharp teeth of sucking pigs. Also, botryomycosis, which is mentioned later in this publication under the heading Differential Diagnosis, sometimes occurs in the sow's udder, as well as in the udder of the cow. The lesions are very similar to actinomycosis. Both actinomycosis and botryomycosis sometimes occur in the horse as a result of wound infections.

DIFFERENTIAL DIAGNOSIS

At one time it was generally believed that the peculiar rayed clubs found in actinomycosis were characteristic of that disease alone. In 1902 similar formations were found in Argentine cattle by Lignieres and Spitz. The cause in these cases was determined to be the organism now known as *Actinobacillus lignieresii*, and the specific disease, actinobacillosis, has since been identified in practically every part of the world, being more prevalent generally than actinomycosis.

Other diseases in which the lesions resemble actinomycosis include botryomycosis, or staphylococcosis, which is attributed to the widely distributed pus-forming staphylococci. Rosettes are found in the lesions of the disease, particularly in cases where the bovine udder is affected. This disease also occurs in horses and hogs.

In coccidioidomycosis, or coccidioidal granuloma, of cattle, sheep, goats, and possibly other animals, the lesions are very much like actinomycosis in some cases. Rayed clubs, or rosettes, much like those present in actinomycosis and actinobacillosis, sometimes occur in the disease.

Tuberculosis may sometimes be mistaken for actinobacillosis and actinomycosis, or vice versa, as may ordinary abscesses due to such common pus-producing organisms as *Corynebacterium pyogenes*, staphylococci, and streptococci.

Exact differentiation of these diseases frequently requires laboratory examinations, including culture of the causative organisms, though the experienced veterinarian can ordinarily distinguish these conditions without resort to technical procedures. Diagnosis is, however, a matter of special importance in disease-control programs and in determining the feasibility or advisability of treatment in individual animals or herds.

TREATMENT

As early as the latter part of the nineteenth century, even before the causes of lumpy jaw were thoroughly understood, potassium iodide had become an established drug in the treatment of the disease. This and other iodine compounds have been used for decades, usually with the best results in what is now recognized as actinobacillosis, especially wooden tongue. Potassium iodide is usually given once a

day in water as a drench, using 1.5 to 2.5 drams of the drug, the dosage depending on the size of the animal and its tolerance and reaction to this somewhat poisonous substance. The treatment is continued usually until symptoms of iodism, or iodine poisoning, occur. The symptoms of iodine poisoning include scurfy skin, catarrh of the nose, abnormal flow of tears, and some impairment of the appetite. These signs ordinarily appear in a week or 10 days in animals responding to the drug. It is generally necessary to repeat the treatment one or more times, withholding the drug for a variable time between the courses of potassium iodide.

The treatment should be given by or under the direct supervision of a veterinarian. The drug may considerably lessen or stop the flow of milk in dairy animals, and, as a portion of the drug is secreted in the milk, it is unsuitable for human consumption. This is no serious drawback, however, since animals affected with actinomycosis are generally excluded by sanitary regulations from the herd supplying milk. In addition to the effect of iodine on the disease, severe general reactions occur in some animals. It is claimed by some persons that breeding animals may be rendered sterile by long-continued administration of the drug, and abortions may result. Care must be taken in drenching animals that the solution does not enter the lungs, for it may cause pneumonia. The total time required for treatment varies from 3 to 6 weeks, but some animals fail to respond to this treatment.

In 1933 Farquharson introduced another treatment for lumpy jaw. It consists of injecting a solution of a less-poisonous salt of iodine, sodium iodide, intravenously, or directly into the blood stream. This treatment is less tedious and is reasonably safe in competent hands. It has been widely adopted by veterinarians, and is generally preferable to any other method of administering iodine. It is especially effective in cases of actinobacillosis of the tongue and lymph nodes. One treatment sometimes suffices, but often two or three are required to effect cures. Some individual animals suffer shock or other severe reactions which make it necessary to discontinue the treatment.

Especially when it affects the bone, actinomycosis is generally less amenable to iodine therapy than is actinobacillosis. Frequently surgery is advised, but in many cases even this is impractical or ineffectual and other expedencies, such as treatment with X-rays, are resorted to. In extreme cases it is preferable to destroy some animals. Others may be affected only locally, in which case most of the carcass may be salvaged.

PREVENTION

So little is known of the life cycles of *Actinobacillus lignieresii* and *Actinomyces bovis* that a complete scientific program for controlling actinobacillosis and actinomycosis has not been developed. No vaccines or serums thus far known are effective in prevention. The mere presence of an affected animal in a herd will not give rise to the disease in the other animals unless the organisms in the pus are introduced into a wound. But animals affected with either actinomycosis or actinobacillosis should be isolated from healthy animals on

general principles, particularly if the lesions have broken or been intentionally opened and pus is being discharged. These animals should be either promptly subjected to treatment or disposed of immediately.

From the evidence available there is every reason to avoid, so far as possible, feeding materials that may injure the mouth or tongue. Excessively coarse or stemmy hay or that which contains much fox-tail, needlegrass, or other injurious plants is especially undesirable. Pastures which contain such plants should be avoided or so managed as to lessen their danger. To some extent this may be accomplished by elimination of overgrazing. Other means include drainage, fertilization, and seeding with more desirable plants. Suggestions for pasture improvement may be obtained from the college of agriculture in the State where help is desired.

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